The rehabilitation scheme in the Kuppanathan Reserve Forest area was inaugurated by the Chief Minister of Madras on 1st December 1957.

The rehabilitation scheme of a capacity of 250 M.W. is to be financed from out of the 500 million Roubles credit offered by the Government of the U.S.S.R. An agreement has been entered into between that Government and the Government of India. The detailed project report has been drawn up and approved. The detailed specifications are being prepared by experts.

The Government of India have also accorded administrative approval and financial sanction for setting up of a fertilizer plant at Neyveli, subject to credit being available in respect of the foreign exchange requirements of the plant.

The pilot briquetting and carbonizing plant obtained under the T.C.M. Aid has arrived. It will be installed at site before the end of June 1958. After experiments have been conducted on briquetting and carbonizing in the atmospheric and other local conditions at Neyveli and the results studied, a specific project report and specifications for a commercial plant will be drawn up.

APPENDIX IV

[Vide answer to starred question No. 301 asked by Sri K. Sattanatha Karayalar (on behalf of Sri M. P. Subramaniam) at the meeting of the Legislative Assembly held on 12th March 1958, page 189 supra.]

PRELIMINIARY REPORT ON BENEFICIATION OF LOW GRADE MAGNETITE FROM SALEM.

Five samples of magnetite (marked HB, MB, LB-A, LB-B & LB-C) each weighing 4 tons, from the (i) higher, (ii) middle and (iii) lower belts respectively of the Kanjamalai hills at Salem, Madras, were received for beneficiation and sintering tests in the Ore-dressing division of the laboratory. The identification marks on the various bags had disappeared by the time they reached Jamshedpur. Consequently, all the five samples had to be mixed for investigation purposes One or two bags of four of the samples, viz., LB-A, LB-B, LB-C and MB, could however be identified and they were kept aside for determining the mineralogical compositions. The sample as received consisted of lumps varying from ½ inch to 4 inches in size. A representative sample of the mixed ore was prepared and a portion crushed to—10 mesh for experimental work. Wet screen analysis of the 10 mesh sample and examination of the various fractions showed that quartz was the

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principal gangue and magnetite was fairly liberated at about—48 mesh size. The sample as received assayed Fe. 36·5; $Sio._2$ 44·2; A 1_20_8 1·92; Cao. 1·8; Mgo. 0·9; P. 0·09 and Tio. 0·2 per cent.

Dry magnetic separation at a low intensity of the sample at—36 mesh produced a concentrate assaying 60·3 per cent Fe and 14·3 per cent Sio2 with a recovery of 71·9 per cent. Magnetic separation at—48 mesh improved the grade to 61·7 per cent Fe for the same recovery. A preliminary wet magnetic separation of the—48 mesh sample yielded a concentrate assaying 61·0 per cent Fe and 13·3 per cent Sio_2 with a recovery of 90·0 per cent Fe.

Further tests are in progress to improve the grade of concentrate by reducing the silica content.

Sintering tests will be taken up after determining the best method of concentrating the ore.

A Preliminary Report of the reducibili y of Salem magnetite ore.

The Reducibility test should be regarded as an essential guide in assessing the suitability of any iron ore for its utilisation in blast furnace or in other iron-making units, either directly or after various agglomerating processes such as sintering, nodulizing, pelletizing, briquetting, etc. The test itself is a complex one because of the many factors that have to be considered in the study of the reducibility of the iron ore such as (i) the inherent reducibility of the ore, (ii) porosity, (iii) size of the ore, (iv) size and shape of the furnace, (v) temperature, (vi) pressure and (vii) velocity of the reducing gas, (viii) gangue materials, etc. The reducibility tests as such are by no means the absolute index of the behaviour of the ores in the reduction furnaces but serve as a fair guide in assessing the different ores. The resutls when compared with certain standard ores that had been utilised sucessfully in the production of iron under well-established processes, however, give a fair idea about the reducibility of the ores.

The relative reducibility test makes it possible to eliminate many factors that are common and with this principle, the effect of size of the particles, temperature and gas velocity alone were considered in the study of the reducibility of Salem magnetite ore. Tests were conducted under similar conditions on uncrushed lumps of Salem magnetite ore and crushed but unconcentrated samples of the ore with hydrogen as reducing agent. Further tests are being carried out at different stages of concentration of the ore.

The Salem magnetite ore contained 36·5 per cent Fe and 44·20 per cent $Sio._2$. Specimen of cubical shape of 1 c m. edge weighing approximately the same weight were prepared by cutting and

grinding the lumps of Salem magnetite ore and these were reduced at various temperatures and gas velocities. Tables I and II indicate the results of the tests carried out on the uncrushed ore.

TABLE I.—*Effect of temperature on the rate of reduction of iron ore.*

H_2 Gas velocity 900 cc. per minute.

Total time of reduction 70 minutes.

	Temperature° C.	Per cent reduction.
1	700	50·41
2	800	68·6
3	900	47·07

TABLE II.—*Effect of rate of flow of hydrogen on the reduction of iron ore.*

	Temperature 900° C. Rate of flow.	Total time of reduction 70 minutes. Per cent reduction.
1	800 c.c. per minute	35·4
2	900 c.c. per minute	47·7
3	1000 c.c. per minute	53·08

It is observed that the reducibility of the ore increased with increase in temperature up to 800°C., while further increase of temperature reduces the reducibility. An increase in gas velocity promotes the reduction rate at 900°C.

It is also observed that even though both the temperature and gas velocity increased the rate of reduction slightly, the overal per cent reduction never exceeded 70 per cent after 120 minutes. It has been found that uncrushed samples do not give very reproducible results as the different lumps may vary in composition.

The next series of experiments were carried out on the crushed and unconcentrated sample in order to get a homogenous sample. The crushed magnetite ore were made into briquettes with dextrine as a binding agent and samples were prepared from these briquettes. The reducibility tests were conducted with these samples at different temperatures and gas velocities. The test was conducted first on—10 mesh size sample because the entire Salem magnetite ore was crushed to—10 mesh and further concentration were being carried out from these crushed sample. Table III indicates the results obtained on different mesh size and uncrushed ore.

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TABLE III.—*Effect of mesh size on the rate of reduction.*

Rate of flow of Hydrogen = 1,000 c.c. per minute.
Temporature of reduction = 900°C.
Total time of reduction = 70 minutes.

	Mesh size.	Per cent reduction.
1 Lump ore	..	53·08
2—10 mesh	..	62·0
3—32+72	..	77·6
4—100	..	55·1

It is observed that the reducibility has a maximum value for —32 + 72 mesh sample and that—100 mesh sample has poor reducibility. Table IV indicates the effect of temperature on the reducibility of—32 + 72 mesh samples.

TABLE IV.—*Effect of temperature on the rate of reduction.*

Mesh size—32+72, rate of flow of hydrogen 1,000 c.c. per minute.
Total time of reduction 70 minutes.

	Temperature° C.	Per cent reduction.
1 600	..	48·5
2 800	..	59·8
3 900	..	77·6
4 1000	..	69·5

It is observed that a maximum reduction 77·6 per cent is obtainedd at 900°C. and the total reduction decreased at 1000 C.

It is clearly seen that the optimum mesh size, temperature and gas velocity and all of them have the effect of increasing the rate of reduction in the initial period of 20 minutes of reduction only and thereafter no appreciable difference is observed. This may be due to the high silica content of the ore which might combine with iron to form fayalite and making the further reduction a very slow process. Further experiments are being carried out to confirm these findings.

With these preliminary data on unconcentrated samples, the test results at different stages of concentration will be compared and the improvement in the reducibility of this ore will be observed.

A preliminary experiment conducted at 800°C. and 1,000 c.c. per minute hydrogen gas velocity with the concentrated ore of—32 mesh size analysing 65 per cent Fe and 8·5 per cent Sio 2 showed a percentage reduction of 71·99 per cent for 70 minutes and 84·14 per cent after 120 minutes respectively.